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METHOD AND DEVICE FOR CHANGING PAIRS OF WORK ROLLS AND/OR PAIRS OF BACKUP ROLLS ON ROLLING STANDS

The invention concerns a method and a device for changing pairs of work rolls and/or pairs of backup rolls on rolling stands, in which, for chocks that are guided in supporting planes, a linear actuator moves the pair of work rolls supported in the chocks in a direction perpendicular to the rolling direction to remove or install it, and in which the pair of backup rolls, which is supported on a roll changing frame, is moved in or moved out by a linear actuator.

It is known (EP 1 136 143 A2; DE 31 23 933 C2) that the operation with a roll changing frame for the backup rolls can be carried out by a separate piston-cylinder actuator installed below the level of the mill floor on the tending side of the rolling stand, and in an operation of this type, the actuator requires a stroke length of 5,500 mm or more. This results in a relatively complicated sequence of movements, since, after the

removal of the pair of work rolls with the aforementioned actuator, only the lower backup roll is moved out. The roll changing frame is then set on this lower backup roll and moved into the rolling stand together with the lower backup roll, and the upper backup roll must then be lowered onto the roll changing frame. After this operation, the entire unit consisting of the upper backup roll, the lower backup roll, and the roll changing frame situated between them can be moved out. A new set of backup rolls can then be installed in the reverse order. With this method, the lower backup roll is moved into the rolling stand twice and then moved back out. Furthermore, considering the high weights, a great deal of time is required, which could be better spent in other ways.

The objective of the invention is to develop a modified method to save time during roll changes and at the same time to create the foundation for this by means of a more favorable device.

In accordance with the invention, the stated objective is achieved on the basis of the operational steps mentioned above by coupling the pair of work rolls to the linear actuator and then moving the pair of work rolls out and uncoupling it, and by

then coupling the same linear actuator to a roll changing frame that has been moved between the backup rolls, and, when the roll changing frame and the upper backup roll are supported on the lower backup roll, moving them out or moving them back in again as a unit. This saves not only time, because both sets of rolls are moved out once together and then moved in again after the exchange has been made, but also equipment expense, because only one piston-cylinder actuator is needed.

Furthermore, this sole piston-cylinder actuator can be further advantageously used in such a way that the roll changing frame is pushed out of the rolling stand or pulled into the rolling stand from the drive side of the rolling stand by the linear actuator with the work rolls removed. Therefore, advantages are gained both with respect to process technology and with respect to equipment engineering.

The device for changing pairs of work rolls and/or pairs of backup rolls in rolling stands assumes backup rolls and work rolls that are each supported in chocks that can be raised and lowered, so that the pair of work rolls, supported in the chocks, can be moved out by means of a linear actuator, and the pair of backup rolls can be moved out or moved in by means of a

lower backup roll supported on a track and wheels and by means of a roll changing frame, which is supported on the lower backup roll and itself supports the upper backup roll.

In accordance with the invention, the device is designed in such a way that the pair of work rolls on the drive side of the rolling stand can be coupled with a hydraulic piston-cylinder actuator that is dimensioned in its stroke length for the removal or installation distance and can be uncoupled when it has been withdrawn the required distance, and that a roll changing frame that has been moved in at the height level between the backup rolls can be coupled to the same piston-cylinder actuator, and then, when the upper backup roll and the roll changing frame are supported on the lower backup roll, the pair of backup rolls can be moved out or moved back in. This saves time during the roll change, and the expense for equipment parts is significantly reduced. For example, only one hydraulic piston-cylinder actuator or a linear drive that operates on some other principle is now necessary.

A further development provides that the piston-cylinder actuator is coupled to a pusher, which has connecting arms aligned with the ends of the rolls. Since the rolls are

provided in pairs as work rolls and as backup rolls, and the roll changing frame is also coupled, the connecting arms are simple means of bridging a portion of the path and of creating a point of connection.

The pusher occupies approximately the width of the rolling stand; accordingly, the piston-cylinder actuator now needs to be designed only for the actual displacement distance. This advantage results in the piston-cylinder actuator being installed on the drive side of the rolling stand and in it being coupled to the pusher with its piston rod.

The connection can be quickly created or broken by arranging clamp heads, which correspond to the ends of the work rolls, on the connecting arms of the pusher.

A connection of this type can be further used by providing shaped parts on the roll changing frame that are assigned to each of the connecting arms. The clamp heads can couple or uncouple the shaped parts.

In this regard, the power supply system of the rolling stand can be utilized by actuating the clamp heads hydraulically or electrically.

Accordingly, the roll changing frame can be lowered to or

raised from the lower backup roll by means of existing hydraulic apparatuses in the rolling stand.

Similarly, the upper backup roll can be hydraulically lowered to or raised from the roll changing frame.

Another advantage is that the set of rolls comprising the two backup rolls can be removed from the rolling stand by means of the pusher and replaced with a new set of rolls.

Embodiments of the invention are illustrated in the drawings and are explained in greater detail below.

-- Figure 1 shows a front view of a complete rolling stand during the removal of the pair of work rolls.

-- Figure 1A shows the same view as Figure 1 but slightly enlarged.

-- Figure 3 shows the same front view of the rolling stand during the removal of the pair of backup rolls.

-- Figure 4 shows a slightly enlarged view of Figure 3.

The rolling stand 1 is shown as a four-high stand (Figures 1, 1A, 2, 2A) with a pair of work rolls 2, which comprises an upper work roll 2a and a lower work roll 2b, and a pair of backup rolls 3, which comprises an upper backup roll 3a and a lower backup roll 3b. The work rolls 2a, 2b and the backup

rolls 3a, 3b are each rotatably supported in chocks 4, and the chocks 4 are supported in the mill housing frame 5. The work rolls 2a, 2b, which are kept a certain distance apart by hydraulic apparatuses 6, can be moved in or out by means of a linear actuator 7, which acts on the ends 8 of the rolls.

The invention is designed in such a way (Figure 1A) that the pair of work rolls 2 on the drive side 12 of the rolling stand 1 is coupled with a hydraulic piston-cylinder actuator 7a that is dimensioned in its stroke length for the removal or installation distance 13 and is uncoupled when it has been withdrawn the required distance 14. At the height level 15 between the backup rolls 3a, 3b (Figure 2, 2A), the roll changing frame 11 can be indirectly coupled to the same piston-cylinder actuator 7a when the upper backup roll 3a is supported on the roll changing frame 11 and the roll changing frame 11 is supported on the chocks 4 of the lower backup roll 3b, and then moved out as a complete unit 3a, 11, 3b by means of the piston-cylinder actuator 7a and moved back in again after the rolls have been exchanged for a new pair of backup rolls 3.

The piston-cylinder actuator 7a is coupled to a pusher 16 with its piston rod 7b. The pusher 16 has connecting arms 17a,

17b assigned to the ends 8 of the rolls, and these connecting arms form an obtuse angle between themselves. Clamp heads 18 are arranged on each of the connecting arms 17a, 17b of the pusher 16. The clamp heads 18 can be hydraulically or electrically operated.

Corresponding to these clamp heads 18, shaped parts 19 are provided on each roll changing frame 11, which likewise interact with the clamp heads 18. The clamp heads 18 are hydraulically operated together with other adjusting means.

The roll changing frame 11 can be lowered onto the lower backup roll 3b by means of hydraulic apparatuses 6 in the rolling stand 1.

Accordingly, the upper backup roll 3a is supported by the roll changing frame 11.

The set of rolls consisting of the backup rolls 3a, 3b and the roll changing frame 11 (Figure 2, 2A) can be moved out by the pusher 16 and exchanged for a new set of rolls.

The procedure during the roll change is directed, in a first step, at moving out the pair of work rolls 2a, 2b after coupling to the linear actuator 7 and then uncoupling them again. In a second step, the same linear actuator 7 is then

coupled to the roll changing frame 11, which has been moved between the backup rolls 3a, 3b, and, after the roll changing frame 11 and the upper backup roll 3a are supported on the lower backup roll 3b, the unit is moved out or, after exchange for a new unit, moved back in. In this operation, the roll changing frame 11 is pushed out of the rolling stand 1 or pulled into the rolling stand 1 from the drive side 12 of the rolling stand 1 by the linear actuator 7 with the work rolls 2a, 2b removed (Figures 2, 2A).

List of Reference Numbers

1	rolling stand
2	pair of work rolls
2a	upper work roll
2b	lower work roll
3	pair of backup rolls
3a	upper backup roll
3b	lower backup roll
4	chocks
5	mill housing frame
6	hydraulic apparatus
7	linear actuator
7a	piston-cylinder actuator
7b	piston rod
8	end of a roll
9	track
10	pairs of wheels
11	roll changing frame
12	drive side

13 installation distance

14 withdrawal distance

15 height level

16 pusher

17a connecting arm

17b connecting arm

18 clamp head

19 shaped part